

# Un-suppressing MI30 Dispersion function for Momentum Scraping

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# Criteria for a Scraper Location

- ❖ In the straight section
  - \* Only from 301 to 305 is available.
- ❖ Non-zero Dispersion function.
  - \* Use trim coils on IQC & IQD.
  - \* Need power supplies.

# MI30 quad configuration

Quad	Style	Amps	(KG-M)/M
Q220	MIQC		
Q221	MIQB		
Q222	MIQB		
Q223	MIQC		
Q224	MIQD		
Q225	MIQD		
Q226	MIQD		
Q227	MIQC		
Q228	MIQB		
Q229	MIQC	-10	-1.4422
Q230	MIQD	-25	-4.1930
Q231	MIQD	10	1.6772
Q232	MIQD	-45	-7.5475
Q301	MIQC	20	2.8844
Q302	MIQB		
Q303	MIQB		
Q304	MIQB		
Q305	MIQB		
Q306	MIQB		
Q307	MIQB		
Q308	MIQB		
Q309	MIQC	20	2.8844
Q310	MIQD	-45	-7.5475
Q311	MIQD	10	1.6772
Q312	MIQD	-25	-4.1930
Q313	MIQC	-10	-1.4422
Q314	MIQB		
Q315	MIQC		
Q316	MIQD		
Q317	MIQD		
Q318	MIQD		
Q319	MIQC		
Q320	MIQB		
Q321	MIQB		
Q322	MIQC		
Q323	MIQD		
Q324	MIQD		
Q325	MIQD		

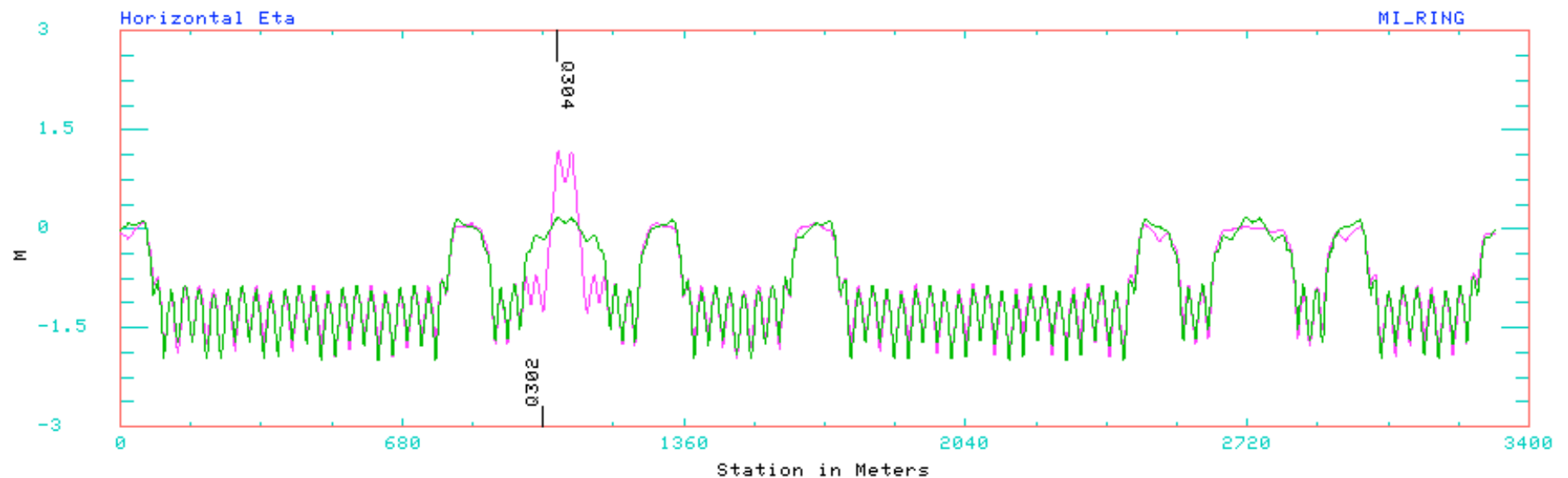
<-- solution for 1.25 m of dispersion at 302 location

<--- MI 22  
short  
straight

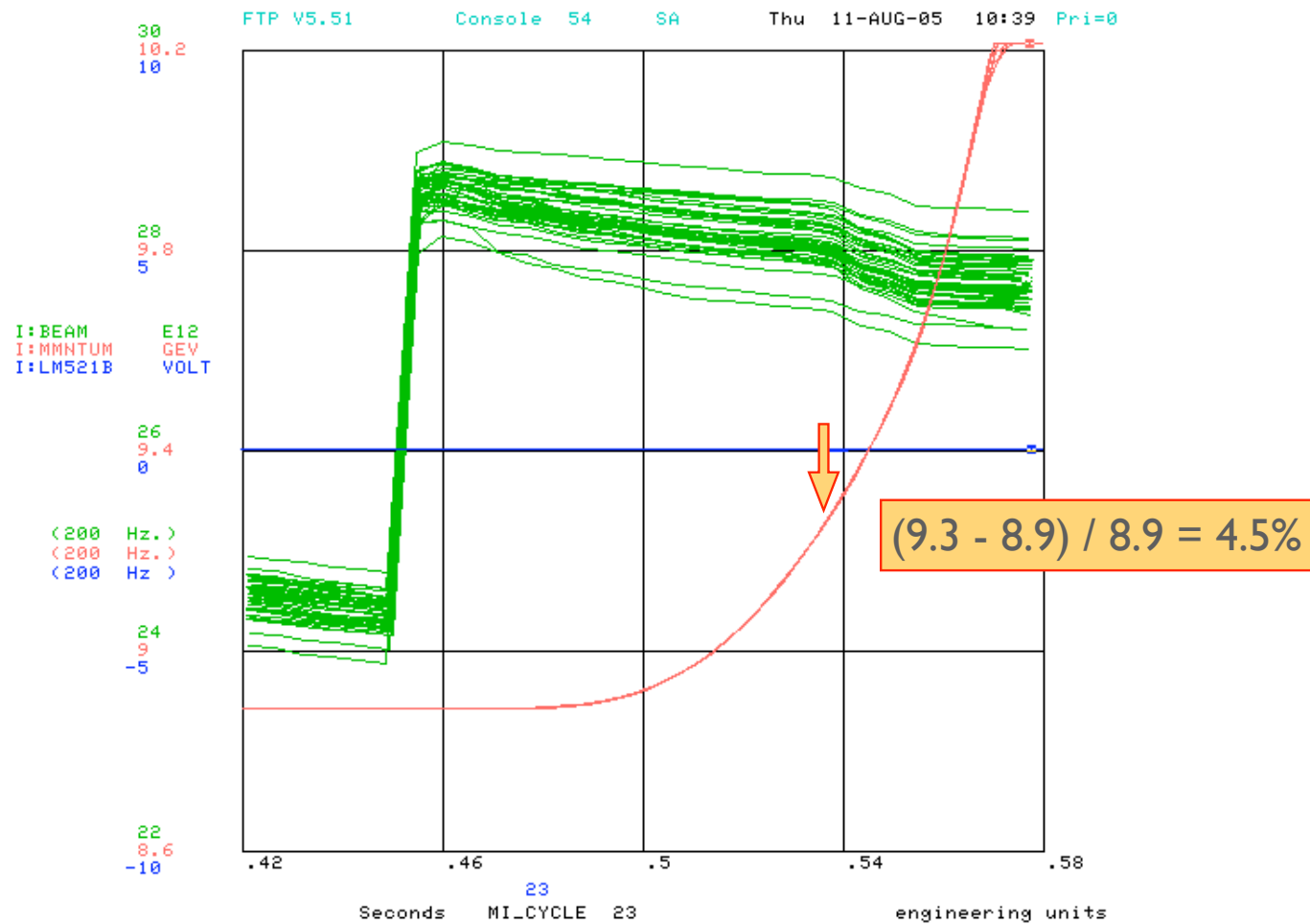
<-- MI30 straight -->

MI 32 --->  
short straight

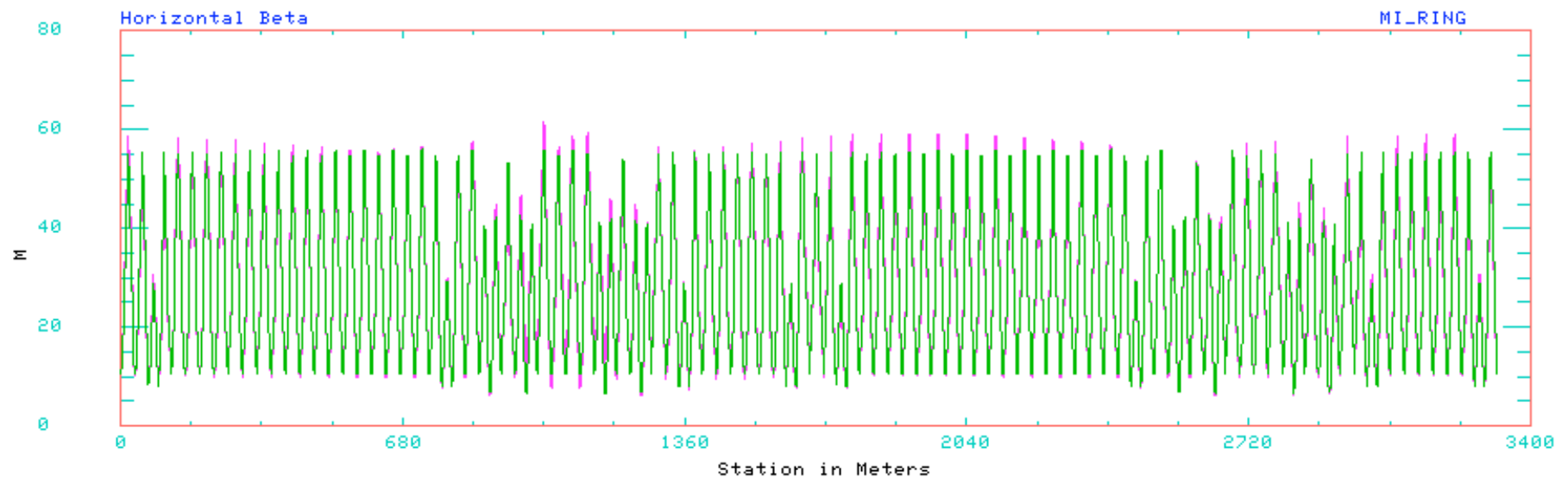
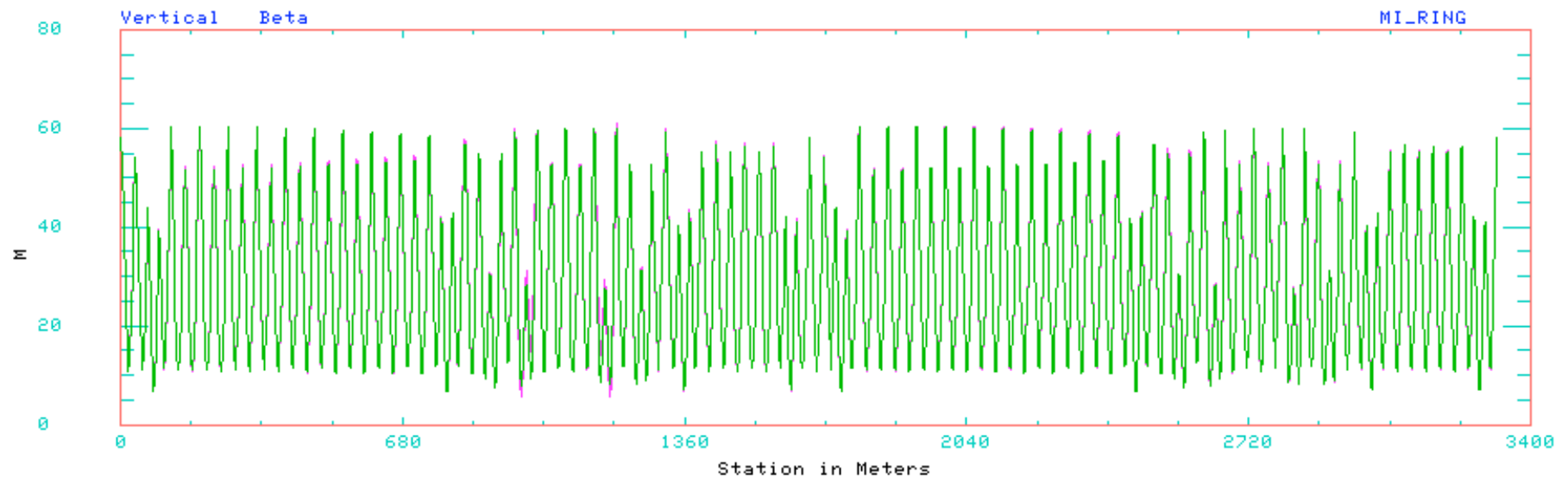
# Resulted dispersion function, ring-wide



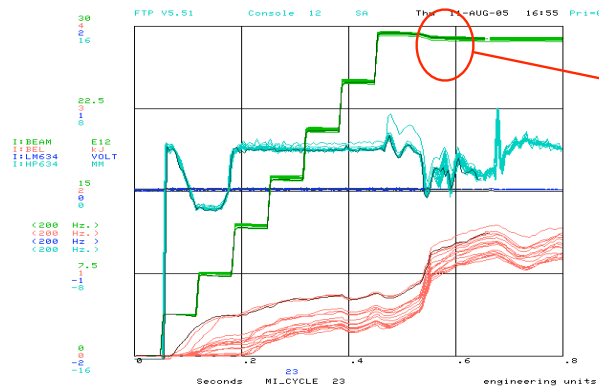
# $\Delta p/p$ of the scraped beam



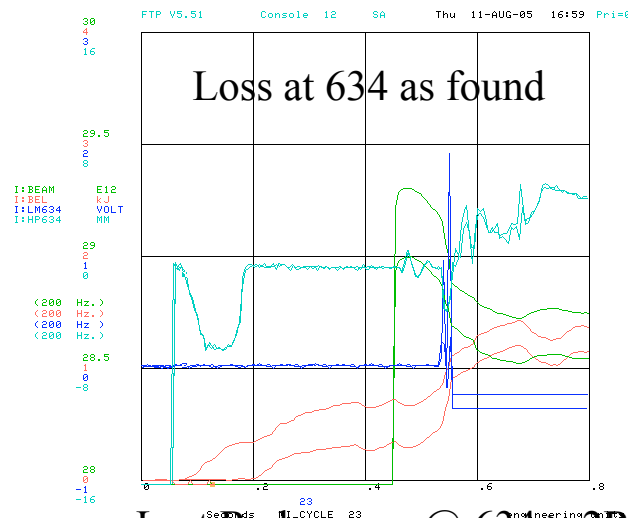
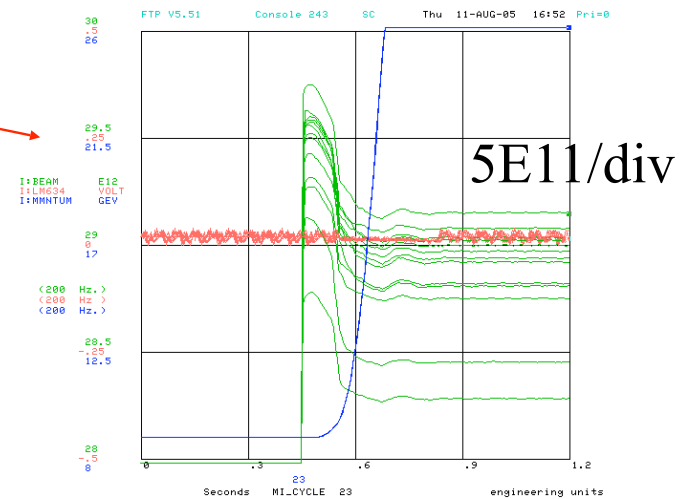
# Impact on ring-wide beta function



# Un-captured beam loss in MI



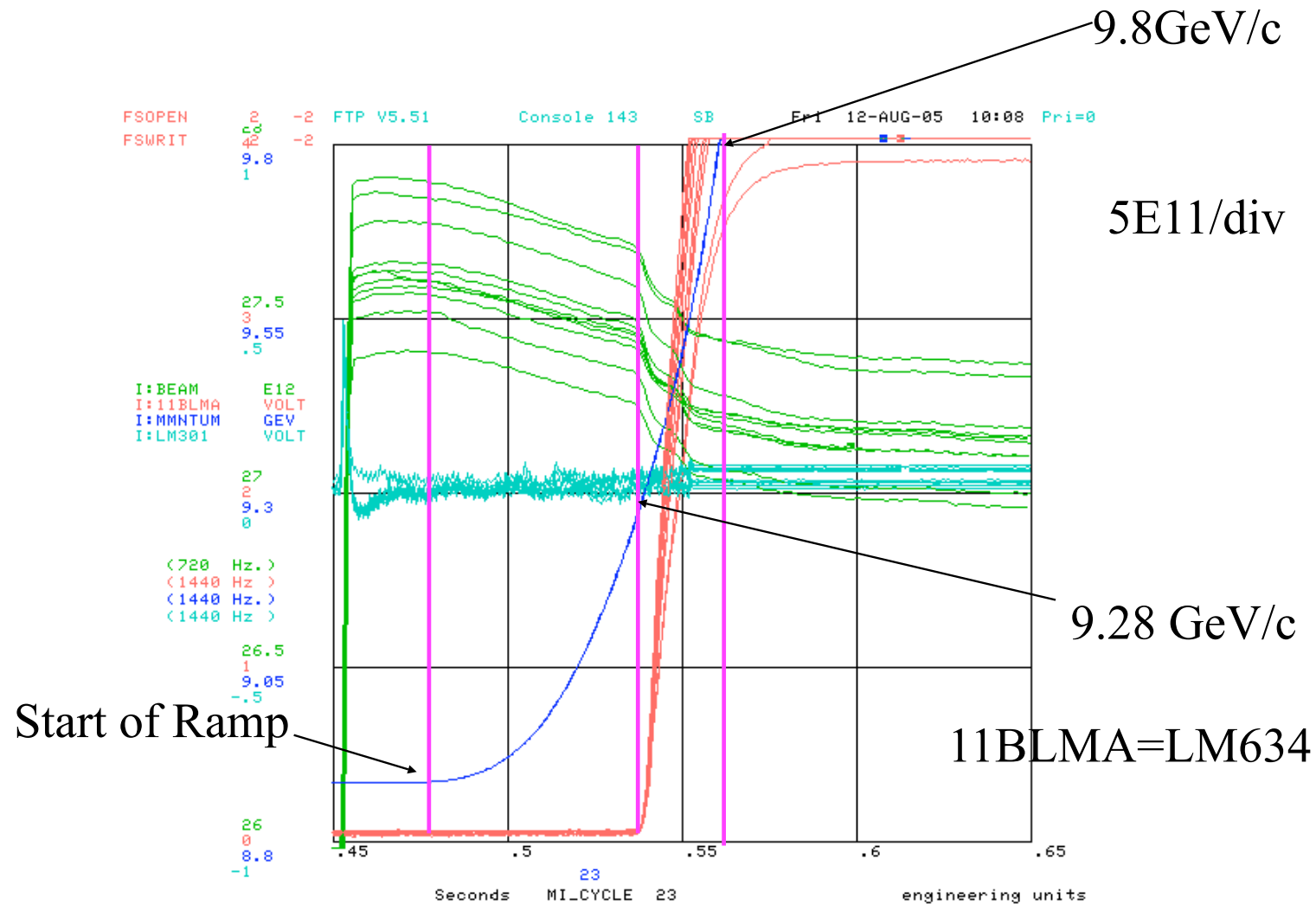
Move orbit outside by ~4 mm  
moves loss elsewhere ???



Last Rad survey @ 634 > 2R/hr

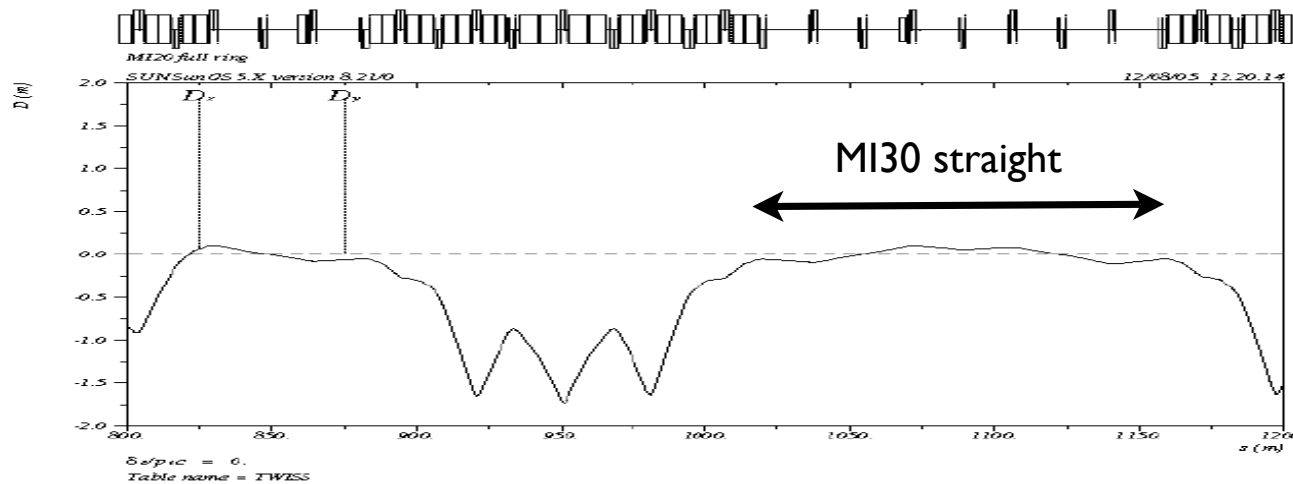
Assume 2.2 sec rep rate  
5550 hrs/year  
5E11 loss/cycle @ acceleration  
⇒ 4.5E18 lost at 9 GeV/year  
⇒ 1992 PSAR limits 1E19/yr @ 8 GeV

# MI Beam Loss upon Acceleration

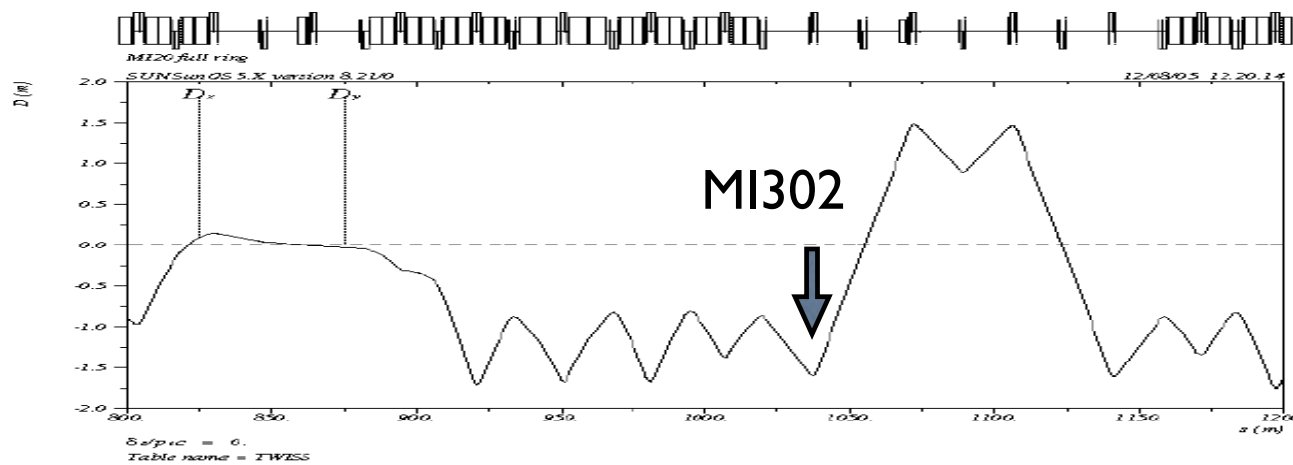




# MI-30 Dispersion Un-suppressor for 1.5 m at 302 location



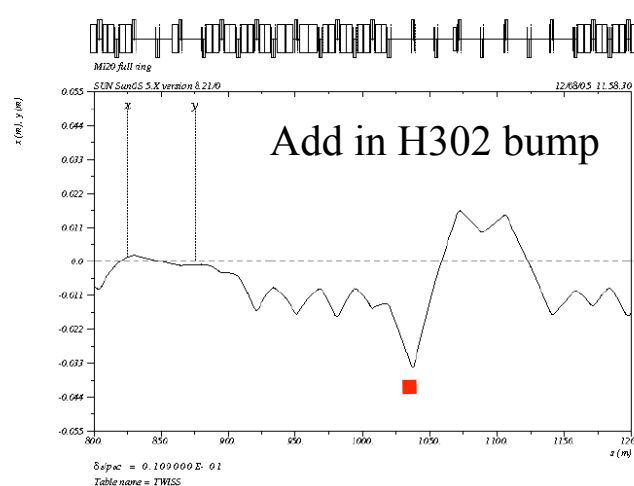
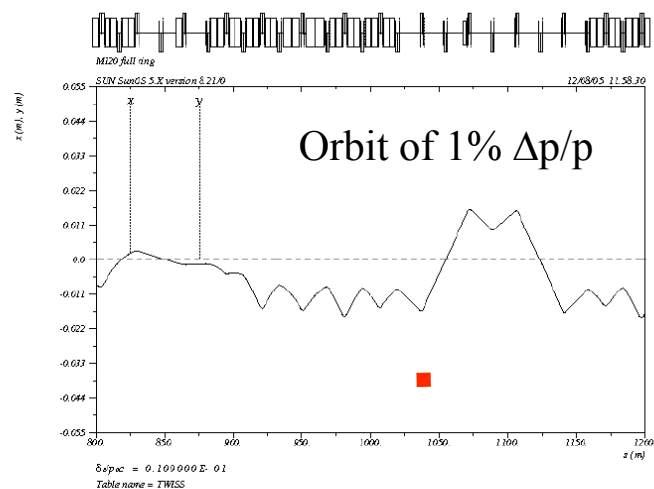
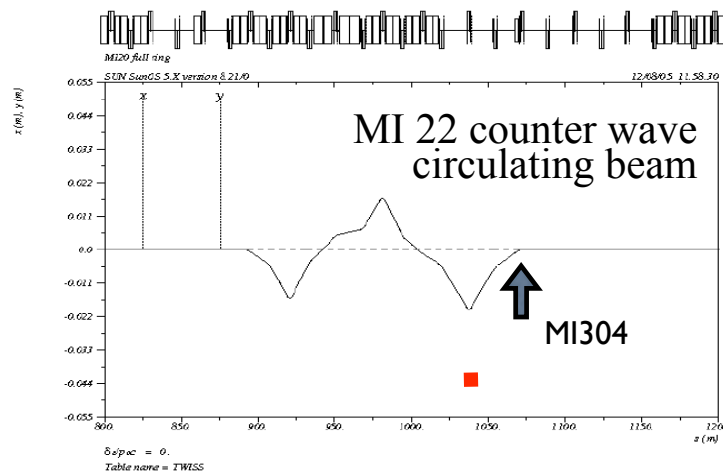
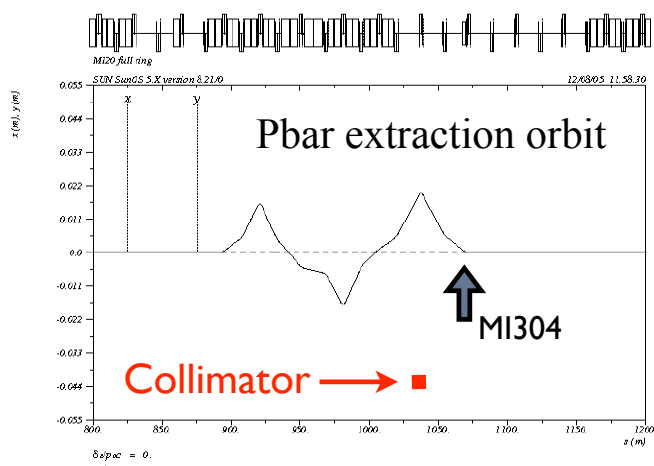
Current dispersion function



Proposed dispersion function

Independent MAD solution with slightly different dispersion function.

# Conceptual orbits through MI30



Want collimator to be the limiting momentum aperture  
 $\Rightarrow$  Assure this with closed orbit bump

# Implementation

- ✿ Primary scraper at MI 302
  - \* Secondary at 304.
- ✿ Ramp off
  - \* Dispersion free.
  - \* Emittance scraping, horizontal plane.
- ✿ Ramp on
  - \* D.C. beam scraping during acceleration.
  - \* Momentum scraping with coasting beam.

# Work needed

- ❖ Evaluate MI momentum aperture
  - \* Needed to determine the optimal dispersion at MI302.
- ❖ Beam loss simulation
- ❖ Power supply issue with EE-support
  - \* Interference with main bus.
- ❖ Lattice
  - \* Fine tune with MAD program.
  - \* Beam measurements.